Recirculating Ventilation of Paint Facilities

Recirculation of Paint Emissions Reduces Exhaust Volume and Improves Operating Costs

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PROBLEM

The processes of application and removal of aircraft surface coatings emit large quantities of organic air pollutants subject to regulation as volatile organic compounds (VOCs).

Aircraft painting facilities are major sources of Hazardous Air Pollutant (HAP) emissions. These will soon be regulated by the EPA through the National Emission Standards for Hazardous Air Pollutants (NESHAP) for Aerospace Manufacturing and Rework Facilities. The adverse health effects of these HAPs include both chronic (*e.g.*, cancer, pulmonary structural changes) and acute health disorders (*e.g.*, dyspnea).

High-VOC coatings will eventually be replaced with materials that do not generate pollutant emissions. However, many of the substitute materials available now are more difficult and expensive to apply, or they perform to lower standards than high-VOC coating materials currently in use. The alternative specified in the NESHAP is the use of emission control technologies. This is technically feasible but economically prohibitive for large volumes of ventilation air required by the Occupational Safety and Health Administration, and Air Force Occupational Safety and Health standards for manned workspaces in painting facilities. As a result, facilities using high-VOC coatings would face high capital costs to implement the required control measures.

C-130 Coated with Strontium Chromate-Containing Primer

SOLUTION

A cooperative effort exists between the US EPA's Air Pollution Prevention and Control Division, and the Air Force Research Lab, Materials and Manufacturing Directorate, Airbase and Environmental Technology Division (AFRL/MLQ), Tyndall AFB, FL. They have determined that applying flow-reduction/recirculation methods in the painting facility offers realistic economics for emission control treatment and overall facility protection. The major economic benefit comes in exchange for a slight yet manageable increase in workplace exposure risk. Recirculation of 90 percent of paint hangar air is the goal. For example, treating and exhausting five percent of circulation air (95-percent recirculation) in a nominal F-15 paint hangar, with the remainder of the air returned to the intake plenum (mixed with fresh make-up air and delivered into the work area), decreases the flow volume to treatment (and the volume of make-up air) from 200 kcfm to 10 kcfm. This is predicted to increase net exposure by one to two percent.

APPROACH

Research and testing conducted in a recirculating booth at Travis AFB, CA, showed that circulating 50 percent of ventilation air from the paint spray facility did not measurably affect the exposure of the painter.

SITE

A 90-percent recirculating ventilation system is scheduled for installation in the C-130 paint hangar at Hill AFB, UT, in 1998. Testing during the late stages of installation and checkout will measure both concentrations in air and breathing-zone exposures in the hangar. Concurrent measurements of performance and operating costs of the control technology will determine overall treatment and cost effectiveness.

PAYOFF

Spray painting ventilation recirculation technologies can greatly decrease the cost of controlling pollutant emissions generated during paint spray operations. It is estimated that facility-operating costs will be trimmed by approximately 75 percent. Although substitution of compliant materials immediately satisfies the applicable NESHAP standard, much greater reductions (lowering facility emissions even below what is permitted under CAAA) will be realized from the application of a control technology (*e.g.*, burner, biofilter for treatment of the VOCs).

FUTURE EFFORT

Continuing research will lead to additional applications within the DOD and in private industry. Results will undoubtedly preserve readiness and reduce air pollution control costs.

Point of Contact

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